

IN THE CLAIMS:

Note that all the claims currently pending in this application, including those not currently being amended, have been reproduced below for the Examiner's convenience.

1. (Original) A deflector comprising:

an electrode substrate having a plurality of through holes, and an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole; and

a wiring substrate having connection wiring pads connected to said electrode pairs of said electrode substrate to individually apply a voltage to said electrode pairs,

wherein said electrode substrate and wiring substrate are bonded via said connection wiring pads of said wiring substrate.

2. (Original) The deflector according to claim 1, wherein regions of said wiring substrate, which correspond to the through holes of said electrode substrate having neither connection wiring pads nor interconnections connected to the connection wiring pads.

3. (Original) The deflector according to claim 1, wherein said wiring substrate is a multilayered wiring substrate.

4. (Original) A deflector comprising:

an electrode substrate having a plurality of through holes, an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole, and electrode wiring pads formed near said first and second electrodes and electrically connected to said first and second electrodes; and

a wiring substrate having connection wiring pads connected to said electrode wiring pads of said electrode substrate to individually apply a voltage to said electrode pairs,

wherein said electrode substrate and wiring substrate are bonded via said connection wiring pads of said wiring substrate and said electrode wiring pads of said electrode substrate.

5. (Original) The deflector according to claim 4, wherein regions of said wiring substrate, which correspond to the through holes of said electrode substrate having neither connection wiring pads nor interconnections connected to the connection wiring pads.

6. (Original) The deflector according to claim 4, wherein said wiring substrate is a multilayered wiring substrate.

7. (Original) The deflector according to claim 1, wherein a grounded shield electrode is formed on a surface of said electrode substrate which opposes a surface bonded to said wiring substrate.

8. (Original) The deflector according to claim 1, wherein the bonding is Au-Sn eutectic bonding.

9. (Original) The deflector according to claim 1, wherein the bonding is Au-Au cold bonding.

10. (Original) A method of manufacturing a deflector by bonding an electrode substrate and wiring substrate, comprising steps of:

preparing an electrode substrate having a plurality of through holes, and an electrode pair made up of first and second electrodes which oppose a side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole;

preparing a wiring substrate having connection wiring pads to be connected to the electrode pairs of the electrode substrate to individually apply a voltage to the electrode pairs;
and

forming a beam aperture in a wiring layer of the wiring substrate before the electrode substrate and wiring substrate are bonded.

11. (Original) A method of manufacturing a deflector by bonding an electrode substrate and wiring substrate, comprising steps of:

preparing an electrode substrate having a plurality of through holes, an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole, and electrode wiring pads formed near said first and second electrodes and electrically connected to said first and second electrodes;

preparing a wiring substrate having connection wiring pads to be connected to the electrode wiring pads of said electrode substrate to individually apply a voltage to said electrode pairs; and

forming a beam aperture in a wiring layer of the wiring substrate before the electrode substrate and wiring substrate are bonded.

12. (Original) A charged particle beam exposure apparatus comprising:

a charged particle source for emitting a charged particle beam; and

a deflector for controlling an image formation position of the emitted charged particle beam,

wherein said deflector comprises:

an electrode substrate having a plurality of through holes, and an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole; and

a wiring substrate having connection wiring pads connected to said electrode pairs of said electrode substrate to individually apply voltages to said electrode pairs, and
said deflector is formed by bonding said electrode substrate and wiring substrate via said connection wiring pads of said wiring substrate.

13. (Original) A charged particle beam exposure apparatus comprising:

a charged particle source for emitting a charged particle beam; and
a deflector for controlling an image formation position of the emitted charged particle beam,
wherein said deflector comprises:
an electrode substrate having a plurality of through holes, an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole, and electrode wiring pads formed near said first and second electrodes and electrically connected to said first and second electrodes; and
a wiring substrate having connection wiring pads connected to said electrode wiring pads of said electrode substrate to individually apply voltages to said electrode pairs, and
said deflector is formed by bonding said electrode substrate and wiring substrate via said connection wiring pads of said wiring substrate and said electrode wiring pads of said electrode substrate.

14. (Original) The deflector according to claim 1, wherein one group of said connection wiring pads are connected to a common interconnection for electrical grounding, and the other group of said connection wiring pads are connected in one-to-one correspondence with interconnections for voltage application.

15. (Original) The deflector according to claim 14, further comprising a shield substrate having a conductive layer,

wherein said shield substrate comprises:

holes formed in positions corresponding to the through holes, and having side walls formed by said conductive layer; and

a pad for connecting to said electrode substrate, and

said shield substrate is electrically grounded by the connection of said pad.

16. (Original) The deflector according to claim 1,

wherein said wiring substrate comprises:

holes extending through said wiring substrate in positions corresponding to the through holes formed in said electrode substrate; and

an electrode electrically connected to side surfaces of the holes, a wiring layer surface at the holes, and a rear surface of said wiring substrate.

17. (Original) A method of manufacturing a deflector by bonding an electrode substrate and wiring substrate, comprising steps of:

preparing an electrode substrate having a plurality of through holes, and an electrode pair made up of first and second electrodes which oppose side walls of each through hole in order to control a locus of a charged particle beam passing through the through hole; and

preparing a wiring substrate to be bonded to the electrode substrate,

wherein in the wiring substrate preparation step, the wiring substrate comprises:

holes extending through the wiring substrate in positions corresponding to the through holes formed in the electrode substrate; and

an electrode electrically connected to side surfaces of the holes, a wiring layer surface at the holes, and a rear surface of the wiring substrate.

18. (Original) The deflector according to claim 1, wherein an electrically grounded electrode is formed on a surface and a rear surface of said electrode substrate.

19. (Original) A deflector comprising:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening; and

a wiring substrate obtained by stacking a first wiring layer having a first interconnection for applying a first voltage to said first electrode and a second wiring layer having a second interconnection for applying a second voltage to said second electrode.

20. (Original) A deflector comprising:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening;

a first wiring substrate having a first interconnection for applying a first voltage to said first substrate; and

a second wiring substrate having a second interconnection for applying a second voltage to said second electrode,

wherein said electrode substrate is arranged between said first and second wiring substrates.

21. (Original) A deflector comprising:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening;

a wiring substrate having an interconnection for applying a predetermined voltage to said first electrode; and

a ground substrate which applies a ground voltage to said second electrode,

wherein said ground substrate is arranged in front of said electrode substrate and said driving substrate with respect to a passing direction of the charged particle beam.

22. (Original) A charged particle beam exposure apparatus comprising a charged particle beam source and a deflector which deflects a charged particle beam emitted from said charged particle beam source,

said deflector including:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening; and

a wiring substrate obtained by stacking a first wiring layer having a first interconnection for applying a first voltage to said first electrode and a second wiring layer having a second interconnection for applying a second voltage to said second electrode.

23. (Original) A charged particle beam exposure apparatus comprising a charged particle beam source and a deflector which deflects a charged particle beam emitted from said charged particle beam source,

said deflector including:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening;

a first wiring substrate having a first interconnection for applying a first voltage to said first substrate; and

a second wiring substrate having a second interconnection for applying a second voltage to said second electrode,

wherein said electrode substrate is arranged between said first and second wiring substrates.

24. (Original) A charged particle beam exposure apparatus comprising a charged particle beam source and a deflector which deflects a charged particle beam emitted from said charged particle beam source,

said deflector including:

an electrode substrate having a plurality of openings, and a plurality of electrode pairs each made up of first and second electrodes which oppose through a corresponding one of the openings in order to deflect a charged particle beam passing through the corresponding opening;

a wiring substrate having an interconnection for applying a predetermined voltage to said first electrode; and

a ground substrate which applies a ground voltage to said second electrode, wherein said ground substrate is arranged nearer to said charged particle beam source than said electrode substrate and said wiring substrate.

25. (Original) A device manufacturing method comprising steps of:

exposing a wafer using a charged particle beam exposure apparatus cited in claim 22; and

developing the wafer.